SEMESTER - I

MODULE CODE	SUB-CATEGORY	MODULE	L	T	P	C	Internal Marks	External Marks	Total Marks
CSEN5101	PC	WIRELESS MOBILE NETWORK	4	0	0	4	50	100	150
CSEN5102	PC	ANALYSIS & DESIGN OF ALGORITHM	4	0	0	4	50	100	150
CSEN5103	PC	ADVANCED OPEARTING SYSTEM	3	1	0	3.5	50	100	150
CSEN5104	PC	ADVANCED OPEARTING SYSTEM LAB	0	0	2	1	25	25	50
CSEN5105	PC	ADVANCED DATABASE MANAGEMENT SYSTEM	3	0	0	3	25	75	100
CSEN5106	PC	ADVANCED DATABASE MANAGEMENT SYSTEM LAB	0	0	2	1	25	25	50
CSEN5107	SP	SPECIAL PROBLEM	0	0	2	1	25	25	50
	GE	ELECTIVE-A$^{\psi}$	4	0	0	4	50	100	150
TOTAL			**18**	**1**	**6**	**21.5**	**300**	**550**	**850**

L = Lecture
T = Tutorial
P = Practical
C = Credit Points

GENERIC ELECTIVE - A$^{\psi}$

MODULE CODE	MODULE
SAPA0020	SAP-ABAP
SAPM0021	SAP-MM
SAPS0022	SAP-SD
SAPH0023	SAP-HCM
SAPF0024	SAP-FI
CCNA0025	CCNA
ECEN5302	COMPUTER COMMUNICATION

PDM UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SEMESTER - I

Wireless Mobile Network

L	T	P
4	0	0

MODULE CODE	CSEN5101
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: In total EIGHT questions will be set. Question ONE will be compulsory and will cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

OBJECTIVES:

This course aims at providing insight and knowledge about architectures and protocols for mobile and wireless communication.

1. To acquire hands-on experience of wireless and mobile networking technologies.
2. To get involved in research projects on advanced topics in mobile ad hoc networks (MANets).
3. To present and write high quality technical reports on protocol design, analysis and simulation.
4. To evaluate designs within the context of local and global needs.
5. To develop and enhance their understanding of the basics of wireless networking, mainly at the network and MAC layers.

LEARNING OUTCOMES:

1. Understand the architecture and applications of current and next generation wireless networks
2. Understand Cellular, WLANs, sensor networks, mobile ad-hoc networks and intermittently connected mobile networks.
3. Learn how to design and analyze various medium access and resource allocation techniques such as power control for fixed-rate and rate-adaptive systems
4. Learn how to design and analyze network layer routing protocols, along with key component mechanisms
5. Learn to design and analyze transport layer protocols, with an emphasis on congestion control.

MODULE CONTENT:

UNIT-I: Introduction to wireless communication system LANs, MANs, WANs, Switching techniques, Wireless ATM networks, Internetworking, Wireless Communication Technology, Propagation modes, LOS transmission, Fading in the mobile environment. Signal encoding, Criteria, Digital data-analog signals, analog data-analog signals, Analog data-Digital signals, Coding.
UNIT-II: Cellular Wireless Networks Principles of cellular network, first, second and third Generation systems. Cordless Systems and WLL, Cordless systems, Wireless Local Loop, IEEE 802.16 fixed broadband wireless access standard. Mobile IP and wireless Access Protocol: Mobile IP, Message authentication, Service primitives and parameters.
UNIT-III: Mobile Networks Overview of wireless telephony, Introduction to Personal Communications Services (PCS): PCS Architecture, mobility management, Networks signaling, Mobility management, Network signaling. General Packet Radio Services (GPRS): GPRS Architecture, GPRS Network Nodes, Mobile Data Communication; Cellular digital packet data (CDPD) Networks.
UNIT-IV: Wireless Application Protocol (WAP) The Mobile Internet standard, WAP Gateway and Protocols, Wireless markup Languages (WML), 3G Mobile Services: Introduction to international Mobile Telecommunications 2000 (IMT 2000) Vision, Ultra Wideband Code division Multiple Access (UW-CDMA),
UNIT-V: Wireless LAN Technology Overview, Infrared LANs, Spread spectrum LANs, Narrowband microwave LANs.IEEE 802.11 Wireless LAN: IEEE 802 protocol architecture, IEEE 802.11 architecture and services, IEEE 802.11 MAC, IEEE 802.11 physical layer. Bluetooth: Overview, Radio specification, baseband specification, Link manager specification, Logical Link control and adaptation protocol.
UNIT-VI: Mobile system design Base station design, mobile receiver, modulation techniques in mobile radio, multiple accessing techniques, wireless networking, Wireless system and standards-GSM services and features, CDMA services, CSMA etc. Wireless standards 2G, 2.5G, 3G+/4G. Wireless communication trends and services

RECOMMENDED BOOKS:

TEXT BOOKS	1. Mobile Cellular Telecommunications by William, C Y Lee McGraw Hill 2
REFERENCEBOOKS	1. Mobile Communication by Jochen Schiller, Pearson Education 2. Wireless Communications by Theodore S Rappaport Pearson's 3. Principles of Wireless Networks by KavehPahlavan and Prashant Krishnamurthy PHI 4. Wireless communication theory by Blake, pub Thomson Delmar 2004

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5
Class Test	x				x
Quiz				x	
Assignment	x			x	x

MAPPING OF COURSE LEARNING OUTCOMES

Student Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	3	1,2		3	4,5	3,4					

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and

- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

PDM UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SEMESTER - I

Analysis & Design of Algorithms

L	T	P
4	0	0

MODULE CODE	CSEN5102
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: In total EIGHT questions will be set. Question ONE will be compulsory and will cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

OBJECTIVES:

1. To make student familiar with the paradigms and approaches used to analyze and design algorithms and to appreciate the impact of algorithm design in practice.
2. Learn how to devise correct and efficient algorithms for solving a given problem.
3. Understand the Greedy Method and how various problems can be solved using Greedy Strategy.
4. To make student familiar with Dynamic Programming, Back Tracking, Branch and Bound and how various problems can be solved using these techniques.
5. To teach about NP Hard and NP Complete Problems and how various problems can be proved NP Hard or NP Complete Problems.

LEARNING OUTCOMES:

On successful completion of this course you will be able to:

1. Develop good principles of algorithm design.
2. Develop data structures and describe the ways in which these data structures can best be implemented.
3. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm.
4. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.
5. Develop algorithms using dynamic-programming paradigm.
6. Prove problems are NP Hard and NP Complete.

MODULE CONTENT:

Unit I: Foundation & Data Structure Foundation & elementary data structure: algorithms, performance analysis: space & time complexity, growth of functions, divide & conquer, recurrence equations, basic elements of data structure like stacks & queues, trees, graphs, linked list, sorting & order statistics.
Unit II: Dynamic sets & searching Introduction, array doubling, amortized time analysis, r-b trees, hashing, dynamic equivalence relations & union-find programs, priority queues with a decrease key operation, graph & graph traversals: DFS, strongly connected components, bi-connected components.
Unit III: Greedy & Dynamic Method General methods, knapsack problem, job sequencing with deadlines, minimum cost spanning trees, optimal merge patters, single-source shortest path, 0/1 knapsack, multistage graphs, all-pair shortest path, optimal binary search trees, travelling salesperson problem, flow shop scheduling.
Unit IV: Backtracking & Branch and Bound General methods, 8 queen's problem, sum of subsets, graph coloring, hamiltonian cycles, knapsack problem, and travelling salesperson problem.
Unit V: NP-Hard & NP-Complete Problems Basic concepts, cook's theorem, NP-hard graph problem, NP-hard scheduling problems. String matching: introduction, a straight forward solution, the knuth-morris-pratt algorithm, the boyer-moore algorithm, approximate string matching.
Unit VI: Parallel & Approximation Algorithms Introduction, parallelism, The PRAM, and other models, some simple PRAM algorithms, handling write conflicts, merge and sorting, finding connected components. Approximation algorithms: introduction, absolute approximations, ϵ- approximations.

RECOMMENDED BOOKS

TEXT BOOK	1. Fundamentals of Computer algorithms, Ellis Horowitz and Sartaj Sahni 1978, Galgotia publ. 2. Introduction to Algorithms, Thomas H Cormen, Harles E leiserson and Ronald Lrivest, 1990, TMH.
REFERENCE BOOK	1. Computer Algorithms: Introduction to design and analysis (3rd edition) by Sara Baase and Allen Van Gelder, Pearson, 2000. 2. Fundamentals of Algorithms by Gilles Brassard and Paul Bratley 3. Design and Analysis of Algorithms (Computer science Series) by Jeffrey D. Smith Publ. 4. Algorithms Design (PIE) by Eva Tardos and Jon Klienberg, pearson.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Assessments	1	2	3	4	5	6
Class Test			x	x	x	x
Quiz	x	x				x
Assignment			x	x	x	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	6	1	2	3	5	4					

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

PDM UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SEMESTER - I

Advanced Operating System

L	T	P
3	1	0

MODULE CODE	CSEN5103
CREDIT POINTS	3.5
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: In total EIGHT questions will be set. Question ONE will be compulsory and will cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

OBJECTIVES:

Students will study advanced operating system topics and be exposed to recent developments in operating systems research.

1. Understand technical details of an operating system.
2. Gain some practical experience with systems programming and tools.
3. Gain experience with defining a deadlock.
4. Build, experiment with, and evaluate different OS.
5. Improve the accuracy and precision with operating system concepts and ideas.

LEARNING OUTCOMES

Following this course student will be able to:

1. Assess the concepts of advanced operating systems, features, types, concurrent process, synchronization, synchronization process, deadlock conditions & avoidance and resource allocations.
2. Understand the concepts of fault recovery and tolerance, classification, recovery, voting and dynamic protocols.
3. Asses the concepts of distributed operating systems,appreciate methods and tools used.
4. Understand the concepts of multiprocessor and database operating systems.

MODULE CONTENT:

UNIT-I: Introduction Introduction, What is an Operating System, Simple Batch Systems, Multi-programmed Batches systems, Time Sharing Systems, Personal-computer systems, Parallel systems, Distributed Systems, Real-Time Systems Memory Management: Background, Logical versus Physical Address space, swapping, Contiguous allocation, Paging, Segmentation, Segmentation with Paging Virtual Memory: Demand Paging, Page Replacement, Page-replacement Algorithms, Performance of Demand Paging, Allocation of Frames, Thrashing.
UNIT-II: Process Processes: Process Concept, Process Scheduling, Operation on Processes, Cooperating Processes, Interprocess Communication CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Algorithm Evaluation
UNIT-III: Semaphores Process Synchronization: Background, The Critical-Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions, Monitors.
UNIT-IV: Deadlocks Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock, Combined Approach to Deadlock Handling. Device Management: Techniques for Device Management, Dedicated Devices, Shared Devices, Virtual Devices.
UNIT-V: Distributed operating system Distributed operating system: Architecture, design issues, Lamport's logic clocks, vector clocks, causal ordering of messages, distributed mutual exclusion, token and non-token based algorithms.
UNIT-VI: Models Distributed file system Mechanism for building DFS, design issues of DFS, case studies, Protection and security, access matrix model, implementation of access matrix model using the capabilities, access control list, lock & key methods. Advance model Advance models: Take grant method, Bell La Padula method. Case studies. Laboratory experiments on internals of Linux, Windows.

RECOMMENDED BOOKS

TEXT BOOK	1. Advanced Concepts in Operating Systemsby Mukesh Singhal and N. G. Shivaratri McGraw- Hill, 2000 2. Distributed Operating System by Tanenbaum.
REFERENCE	1. Operating System Concepts by Abraham Silberschatz, Peter B. Galvin, G. Gagne, Sixth Addison n Wesley Publishing Co., 2003. 2. Modern Operating Systems by Andrew S. Tanenbaum, Second Edition, Addison Wesley, 2001. 3. Wireless and Mobile Networks Architectureby Yi –Bing Lin &ImrichChlamatac, John Wiley & Sons, 2001.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Assessments	1	2	3	4
Class Test		x	x	
Quiz	x			x
Assignment	x	x		x

MAPPING OF COURSE LEARNINGOUTCOMES

Student Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	2	1	3,4	2,3,5	1,2						

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and

- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

PDM UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SEMESTER - I

Advanced Operating System Lab

L	T	P
0	0	2

MODULE CODE	CSEN5104
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

OBJECTIVES

1. To understand the services provided by and the design of an operating system.
2. To understand the structure and organization of the file system.
3. To understand what a process is and how processes are synchronized and scheduled.
4. To understand different approaches to memory management.
5. Students should be able to use system calls for managing processes, memory and the file system.
6. Students should understand the data structures and algorithms used to implement an OS.

LEARNING OUTCOMES

Following this course students will be able to:

1. Explain the objectives and functions of Operating Systems Lab.
2. Understand various commands of Operating System.
3. Understand difference between various types of OS commands.
4. Understand vi editor.
5. Find greatest of three number using shell programming.
6. Find factorial of a given number using shell programming.

LIST OF EXPERIMENTS

1.	Study of LINUX Operating System (Linux kernel, shell, basic commands pipe& filter).
2.	Writing of Shell Scripts (Shell programming).
3.	To write a C program for implementation of System Calls.
4.	To write a C program for File Permissions.
5.	To write a C program for File Operations.
6.	To write a C program for File Copy and Move.
7.	To write a C program for Dining Philosophers Program..
8.	To write a C program for Producer-Consumer Problem concept.
9.	To write a C program for the following Job Scheduling Algorithms: 1. First Come First Serve Algorithm 2. Shortest Job First Scheduling Algorithm
10.	To implement the following memory management schemes: 1. First Fit Algorithm 2. Best Fit Algorithm.
11.	Write a program in vi editor to find factorial of a given number.
12.	Write a program in vi editor to find number is prime or not.
Experiments based on advanced topics:	
13.	To implement Page replacement algorithms: 1. First In First Out (FIFO)
14.	Write a shell program to perform operations using CASE statement such as addition, subtraction, multiplication and division.

Note: At least 12 Experiments out of the list must be done in the semester.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Student Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	2	1	3,4	5,6	1						

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

PDM UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SEMESTER - I

Advanced Database Management System

L	T	P
3	0	0

MODULE CODE	CSEN5105
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: In total EIGHT questions will be set. Question ONE will be compulsory and will cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

OBJECTIVES:

The aim of this subject is to teach students the advanced concepts of database management system. It will also enable students to learn advanced concepts like parallel and distributed databases, objected oriented and object relational databases, multimedia database system and WEB database.

1. To teach the behavior of relational databases.
2. To understand and analyze parallel and distributed databases.
3. To make students familiar with basic concepts of objected oriented and object relational databases.
4. To teach about the multimedia database system.
5. To make students familiar with WEB database.

LEARNING OUTCOMES:

Following this course:

1. Students will be able to characterize the behaviour of relational databases.
2. Students will understand parallel and distributed databases.
3. Students will be able to learn the basic concepts of objected oriented and object relational databases.
4. Ability to understand the multimedia database system.
5. Student will be able to learn the WEB database.

MODULE CONTENT

UNIT-I: Relational Databases Integrity Constraints revisited, Extended ER diagram, Relational Algebra, Structure of RDBMS, Normal forms.
UNIT-II: Parallel and Distributed Databases Distributed Data Storage – Fragmentation & Replication, Location and Fragment Transparency Distributed Query Processing and Optimization, Distributed Transaction Modeling and concurrency Control, Distributed Deadlock, Commit Protocols, Design of Parallel Databases, Parallel Query Evaluation.
UNIT-III: Objected Oriented and Object Relational Databases Modeling Complex Data Semantics, Specialization, Generalization, Aggregation and Association, Objects, Object Identity, Equality and Object Reference, Architecture of Object Oriented and Object Relational Databases
UNIT-IV: Multimedia Database System multimedia database management system, image and text database techniques, Audio and Video Database Techniques Physical Storage and Retrieval. Data structure, Operation, indexing, segmentation.
UNIT-V: WEB Database Accessing Databases through WEB, WEB Servers, XML Databases, and Commercial Systems.
UNIT-VI: Data Mining & Data Warehousing Knowledge Representation Using Rules, Association and Classification Rules, Sequential Patterns, Algorithms for Rule Discovery, Data Warehousing Architecture, Multidimensional Data Model, Update Propagation OLAP Queries.

RECOMMENDED BOOKS

TEXT BOOK	1. Database Management Systems by R. Ramakrishnan McGraw Hill International Editions, 1998 2. Principals of Distributed Database system (2nd edition) by M. Tamer Ozsu. Patrick valduriez (Pearson) 3. Database system Concepts by Silberscatz, Korth, Sudarshan, Mcgraw Hill, 6th Edition, 2006
REFERENCE	1. An Introduction to Database Systems by Date, Kannan, Swaminathan, 8th Edition Pearson Education, 2007 2. Database System Concepts, design and application by Singh S.K, Pearson Education, 2006. 3. Modern Database Systems by W. Kim, ACM Press, Addision – Wesley, 1995 4. Principals of Database Systems by Ullman, J. D., Galgotia publications, 1999.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Assessments	1	2	3	4	5
Class Test	x	x		x	X
Quiz	x		x		
Assignment	x		x	x	X

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes		1	3	2	5	4					

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

PDM UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SEMESTER - I

Advanced Database Management System Lab

L	T	P
0	0	2

MODULE CODE	CSEN5106
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

OBJECTIVES

1. To apply the knowledge of Data Definition Language.
2. To apply the knowledge of SQL Queries in DBMS.
3. To apply the knowledge of PL/SQL to create procedures and functions.
4. To learn about the components of Visual Basic for creating forms.

LEARNING OUTCOMES

Following this course, students will be able:

1. To apply the knowledge of Data Definition Language.
2. To learn about the knowledge of SQL Queries in DBMS.
3. To apply the knowledge of PL/SQL to create procedures and functions.
4. To learn about the components of Visual Basic for creating forms.

LIST OF EXPERIMENTS

1.	To implement Data Definition language 1.1. Create, alter, drop, truncate 1.2. To implement Constraints. 1.2.1. (a). Primary key, (b). Foreign Key, (c). Check, (d). Unique, (e). Null, (f). Not null, (g). Default, (h). Enable Constraints, (i). Disable Constraints (j). Drop Constraints
2.	To implementation on DML, TCL and DRL 2.1. (a).Insert, (b).Select, (c).Update, (d).Delete, (e).commit, (f).rollback, (g).save point, (i). Like'%', (j).Relational Operator.
3.	To implement Nested Queries 3.1.(a). To implementation of Nested Queries
4.	To implement Join Queries 4.1. (a) Inner join, (b).Left join, (c).Right join (d).Full join

5.	To implement Views 5.1. (a). View, (b).joint view, (c).force view, (d). View with check option
6.	Control Structure 6.1. To write a PL/SQL block for Addition of Two Numbers 6.2. To write a PL/SQL block for IF Condition 6.3. To write a PL/SQL block for IF and else condition 6.4. To write a PL/SQL block for greatest of three numbers using IF AND ELSEIF 6.5. To write a PL/SQL block for summation of odd numbers using for LOOP
7.	Procedures 7.1. To write a PL/SQL Procedure using Positional Parameters 7.2. To write a PL/SQL Procedure using notational parameters 7.3. To write a PL/SQL Procedure for GCD Numbers 7.4. To write a PL/SQL Procedure for cursor implementation 7.5. To write a PL/SQL Procedure for explicit cursors implementation 7.6. To write a PL/SQL Procedure for implicit cursors implementation
8.	Functions: 8.1. To write a PL/SQL block to implementation of factorial using function 8.2. To write a PL/SQL function to search an address from the given database
9.	Front End Tools 9.1. To design a form using different tools in Visual Basic
10.	Form 10.1. To design a Single Document Interface and Multiple Document Interface forms using Visual Basic.
11.	Trigger 11.1. To write a Trigger to pop-up the DML operations 11.2. To write a Trigger to check the age valid or not Using Message Alert. 11.3. Create a Trigger for Raise appropriate error code and error message. 11.4. Create a Trigger for a table it will update another table while inserting values
12.	Menu Design 12.1. To design a Note Pad Application menu using Visual Basic.
Experiments based on advanced topics:	
13.	Report design 13.1. To design a report using Visual Basic.
14.	To design the Database and Implement it by using VB (Mini Project). 14.1. Passport Automation System.

Note: At least 12 Experiments out of the list must be done in the semester.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes		1	4	2		3					

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER – II

MODULE CODE	SUB-CATEGORY	MODULE	L	T	P	C	Internal Marks	External Marks	Total Marks
CSEN5108	PC	DATA WAREHOUSE AND MINING	3	1	0	3.5	50	100	150
CSEN5109	PC	KNOWLEDGE BASED SYSTEM DESIGN	3	0	0	3	25	75	100
CSEN5110	PC	KNOWLEDGE BASED SYSTEM DESIGN LAB	0	0	2	1	25	25	50
CSEN5111	PC	SOFT COMPUTING	3	0	0	3	25	75	100
CSEN5112	PC	SOFT COMPUTING LAB	0	0	2	1	25	25	50
CSEN5113	SP	SEMINAR	0	0	2	1	25	25	50
RESM0101	PC	RESEARCH METHODOLOGY	4	0	0	4	50	100	150
	PE	ELECTIVE-I	4	0	0	4	50	100	150
TOTAL			**17**	**1**	**6.5**	**20.5**	**275**	**525**	**800**

L = Lecture
T = Tutorial
P = Practical
C = Credit Points

PROGRAM ELECTIVE I

MODULE CODE	MODULE
CSEN5214	OPTIMIZATION TECHNIQUES
CSEN5215	MATHEMATICAL FOUNDATION & COMPUTER SCIENCE

PDM UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SEMESTER - II

Data Warehouse and Mining

L	T	P
4	0	0

MODULE CODE	CSEN5108
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: In total EIGHT questions will be set. Question ONE will be compulsory and will cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

OBJECTIVES:

The aim of this subject is to teach students about different Data warehouse and Data mining techniques along with their implementation.

1. Identify the scope and necessity of Data Mining & Warehousing for the society.
2. Describe the designing of Data Warehousing so that it can be able to solve the root problems.
3. To understand various tools of Data Mining to solve the real time problems.
4. To develop ability to design various algorithms based on data mining tools.
5. To develop further interest in research and design of new Data Mining Techniques.

LEARNING OUTCOMES:

1. Able apply data mining techniques and methods to large data sets.
2. Able to use data mining tools.
3. Able process raw data to make it suitable for various data mining algorithms.
4. Able to discover and measure interesting patterns from different kinds of databases.
5. Able to apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data.

MODULE CONTENT:

UNIT I: Data Warehousing Data warehousing Components, building a data warehouse, mapping the data warehouse to a multiprocessor architecture, DBMS schemas for decision support, data extraction, cleanup, and transformation tools, metadata.
UNIT II: Business Analysis Reporting and Query tools and Applications, tool categories, The need for applications, Cognos Impromptu , Online Analytical Processing (OLAP), multidimensional data model, OLAP guidelines, multidimensional versus multirelational OLAP, categories of tools, OLAP tools and the Internet.
UNIT III: Data Mining Introduction, data, types of data, data mining functionalities, interestingness of patterns, classification of data mining systems, data mining task primitives, integration of a data mining system with a data warehouse, issues, data preprocessing.
UNIT IV: Association Rule Mining Mining frequent patterns, associations and correlations, mining methods, mining various kinds of association rules, correlation analysis, constraint based association mining.
UNIT V: : Classification and Clustering Issues regarding classification and prediction: classification methods: Decision tree, Bayesian Classification, Rule based, CART, Neural Network, CBR, Rough set Approach, Fuzzy Logic, and Genetic Algorithms, Prediction methods: Linear and nonlinear regression, Logistic Regression, What is Cluster Analysis?, Types of data in cluster analysis, A categorization of major clustering methods, types of clustering algorithms.
UNIT VI: Advance Topics of Data Mining and its Applications Mining Time, Series and Sequence Data, Mining Text Databases, mining the World Wide Web, data mining applications.

RECOMMENDED BOOKS:

TEXT BOOK	1. Data Warehousing, Data Mining & OLAP by Alex Berson and Stephen J. Smith, Tata McGraw, Hill Edition, Tenth Reprint 2007. 2. Introduction to Data Mining by Pang, Ning Tan, Michael Steinbach and Vipin Kumar, Person Education, 2007.
REFERENCE	1. Insight into Data mining Theory and Practice by K.P. Soman, Shyam Diwakar and V. Ajay, Easter Economy Edition, Prentice Hall of India, 2006.. 2. Introduction to Data Mining with Case Studies by G. K. Gupta, Easter Economy Edition, Prentice Hall of India, 2006.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5
Class Test		x	x		x
Quiz			x	x	x
Assignment	x	x		x	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	1	3	5	2	5	4	2	3	4	2	1

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and

- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

PDM UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SEMESTER - II

Knowledge Based System Design

L	T	P
3	0	0

MODULE CODE	CSEN5109
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: In total EIGHT questions will be set. Question ONE will be compulsory and will cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

OBJECTIVES:

1. To achieve knowledge and understanding on fundamentals of Prolog.
2. The concepts of expert systems will be introduced
3. The students will design an expert system using appropriate knowledge-based software tools.
4. To introduce the features of a feasible expert system.
5. To enable students to use various knowledge representation methods and different expert system structures from the industrial engineering point of view.
6. To allow students to present oral and written reports.
7. Apply AI techniques to the problem of acquisition and representation of expert knowledge for problem solving in the expert's domain.

LEARNING OUTCOMES:

Following this course, students will be able:

1. To get the concepts of Prolog.
2. To understand the knowledge-based systems representation.
3. To implement a small knowledge- based system.
4. To understand the role of Artificial Intelligence, Expert Systems and Decision Models in managerial decision-making.
5. To get an In-Depth Knowledge of Machine Learning.

MODULE CONTENT:

UNIT-I: Introduction to Programming Logic Introduction to Logic, Propositional Logic concepts, Logic Programming in Prolog.
UNIT II: Knowledge Engineering Knowledge Engineering: The human expert and an Artificial Expert, knowledge base and inference engine, knowledge acquisition and knowledge representation.
UNIT III: Problem Solving Problem solving process: rule based systems, heuristic classifications, constructive problem solving.
UNIT IV: Expert Systems Tools for building expert systems, case based reasoning, semantic of expert systems, modeling of uncertain reasoning, applications of semiotic theory; Designing for explanation.
UNIT V: Expert System Architecture and Programming Expert system architectures, high level programming languages, logic programming for expert systems.
UNIT VI: Machine Learning Machine learning, rule generation and refinement, learning evaluation, testing and tuning.

RECOMMENDED BOOKS

TEXT BOOK	1. PROLOG: Programming for Artificial Intelligence, 3e, by Ivan Bratko. 2. Introduction to Expert Systems, 3rd Edition by Pearson Education 2007 by Peter Jackson. 3. AI and Expert Systems: a comprehensive guide, C language, 2nd edition, McGraw-Hill 1990 by Robert I. Levine, Diane E. Drang, Barry Edelson. 4. Expert Systems: Theory and Practice, 4th printing, Prentice-Hall of India, 2001, by Jean-Louis Ermine. 5. Artificial Intelligence: A Modern Approach, 2nd Edition, Pearson Education, 2007 by Stuart Russell, Peter Norvig
REFERENCE	Artificial Intelligence and Intelligent Systems, 4th impression , Oxford University Press, 2007 by Padhy N.P.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	10
3.	Group Discussion	4	05
4.	End Semester Exam	1	75

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5
Class Test	x		x		x
Quiz		x			x
Assignment	x		x	x	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	1	2,3	2,3	4	4,5	5	4,5	4	4,5	4	4

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

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PDM UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SEMESTER - II

Knowledge Based System Design Lab

L	T	P
0	0	2

MODULE CODE	CSEN5110
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

OBJECTIVES:

1. To introduce the basic concepts of prolog.
2. To implement the first order predicate logic.
3. To write program in prolog like factorial.
4. To implement various programs like Travelling Salesman Problem,8 puzzle problem, etc.

LEARNING OUTCOMES:

Following this course, students will be able:

1. To get the concepts of programming logic.
2. To get the knowledge of solving different first predicate logic in prolog.
3. To learn about the List and it's various operations like union and intersection of two given list.
4. To get the knowledge of writing programs in prolog like water jug problem.
5. To implement various searching techniques.

LIST OF EXPERIMENTS

1.	Study of Prolog.
2.	Write a program in prolog for first order predicates for person activity system.
3.	Write a first order predicate logic in prolog for cars.
4.	Write a program of first predicate logic in prolog for a family relation problem.
5.	Write a program for factorial in prolog.
6.	Write a program to implement Towers of Hanoi.
7.	Write a program for menu driven program for member concatenation, permutation, add and delete function in prolog.
8.	Write a program in prolog to find the union and intersection of two given list.
9.	Write a program to implement Travelling Salesman Problem.
10.	Write a program to implement 8 puzzle problem.
11.	Write a program to implement water jug problem.
12.	Write a program to solve monkey banana problem.
Experiments based on advanced topics:	
13.	Write a program to implement breadth first search, depth first search and best first search.
14.	Write a program to solve traversal problem using mean end analysis.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	H	i	j	k
Course Learning Outcomes	1	1,2	2	4,5	4,5	2,4,5	5	4,5	5	5	5

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

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PDM UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SEMESTER – II

Soft Computing

L	T	P
3	0	0

MODULE CODE	CSEN5111
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: In total EIGHT questions will be set. Question ONE will be compulsory and will cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

OBJECTIVES:

The aim of this subject is to teach student's concept Artificial Neural Networks, how it is related to biological neural networks and how it is implemented and to understand Fuzzy logic's concepts.

1. To familiarize with soft computing concepts.
2. To introduce the ideas of neural networks, fuzzy logic and use of heuristics based on human experience.
3. To introduce the concepts of Genetic algorithm and its applications to soft computing using some applications.
4. To understand the concept of automated machines.
5. To apply logics of Fuzzy and to solve various problems like tipping problem.

LEARNING OUTCOMES:

Following this course, students will be able to:

1. Apply various Soft Computing frame works.
2. Design various neural networks.
3. Understand the use of Fuzzy Logic.
4. Apply genetic programming.
5. Understand hybrid soft computing.

MODULE CONTENT:

Unit I : Artificial Neural Network

Introduction , Fundamental concept, Evolution of Neural Networks, Basic Models of Artificial Neural Networks, Important Terminologies of ANNs, McCulloch,Pitts Neuron, Linear Separability, Hebb Network. Supervised Learning Network: Perceptron Networks, Adaline, Multiple Adaptive Linear Neurons, Back Propagation Network, Radial Basis Function Network.

UNIT II: Associative Memory

Associative Memory Networks: Training Algorithms for Pattern Association, Autoassociative Memory Network, Heteroassociative Memory Network, Bidirectional Associative Memory, Hopfield Networks, Iterative Autoassociative Memory Networks, Temporal Associative Memory Network. Unsupervised Learning Networks: Fixed weight Competitive Nets, Kohonen, Self-organizing Feature Maps, Learning Vector Quantization, Counter propagation Networks, Adaptive Resonance Theory Networks , Special Networks.

UNIT III: Fuzzy Set Theory

Introduction to Classical Sets and Fuzzy sets, Classical Relations and Fuzzy Relations, Tolerance and Equivalence Relations, Noninteractive Fuzzy sets, Membership Functions: Fuzzification, Methods of Membership Value Assignments, Defuzzification, Lambda,Cuts for Fuzzy sets and Fuzzy Relations, Defuzzification Methods.

UNIT IV: Fuzzy Arithmetic and Fuzzy Measures

Fuzzy Arithmetic and Fuzzy Measures: Fuzzy Rule Base and Approximate Reasoning: Truth values and Tables in Fuzzy logic, Fuzzy Propositions, Formation of Rules, Decomposition and Aggregation of rules, Fuzzy Reasoning, Fuzzy Inference Systems (FIS), Fuzzy Decision Making, Fuzzy Logic Control Systems.

UNIT V: Genetic Algorithm

Introduction, Basic Operators and Terminologies in GAs, Traditional Algorithm vs. Genetic Algorithm, Simple GA, General Genetic Algorithm, The Scheme Theorem, Classification of Genetic Algorithm, Holland Classifier Systems, Genetic Programming. Applications of Soft Computing: A Fusion Approach of Multispectral Images with SAR Image for Flood Area Analysis, Optimization of Travelling Salesman Problem using Genetic Algorithm Approach.

UNIT VI: Hybrid Fuzzy

Genetic Algorithm based Internet Search Technique, Soft Computing based Hybrid Fuzzy Controllers, Soft Computing based Rocket Engine, Control.

RECOMMENDED BOOKS:

TEXT BOOK	Principles of Soft Computing by S.N. Sivanandan and S.N. Deepa, Wiley India, 2007. ISBN: 10: 81,265,1075,7.
REFERENCE	1. Neural Networks, Fuzzy Logic and Genetic Algorithms by S. Rajasekaran and G.A.V.Pai, , PHI, 2003. 2. Fuzzy Logic with Engineering Applications byTimothy J.Ross, McGraw,Hill, 1997. 3. Neuro, Fuzzy and Soft Computing by J.S.R.Jang, C.T.Sun and E.Mizutani, PHI, 2004, Pearson Education.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, online support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	10
3.	Group Discussion	4	05
4.	End Semester Exam	1	75

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Assessments	1	2	3	4	5
Class Test	x		x		x
Quiz		x	x		
Assignment	x		x	x	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	1	2,3	4	1	3		2,3	3,4,5			

EVALUATION:

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

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PDM UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SEMESTER – II

Soft Computing Lab

L	T	P
0	0	2

MODULE CODE	CSEN5112
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

OBJECTIVES:

1. To implement decision boundaries and activation functions using MATLAB- Neural Network's tool.
2. To implement supervised learning in neural networks.
3. To implement knowledge of computation and dynamical systems using neural networks.
4. To implement tipping problem using MATLAB- Fuzzy logic's Tool.
5. To understand automated washing machine control.
6. To understand the difference between sugeno and mamdani Methods.

LEARNING OUTCOMES

Following this course, students will be able:

1. To implement neural network's activation functions and decision boundaries.
2. To learn various learning algorithms and their implementation.
3. To apply fuzzy logics in MATLAB.
4. To learn and use automated functionality of machines like Washing machine.
5. To design and conduct experiments to differentiate sugeno and mamdani methods.

LIST OF EXPERIMENTS

1	Practice of MATLAB- Neural network's tool.
2	Write a program to perform various operations on variables.
3	(3.1) Write a program to perform basic operation on matrix.
	(3.2) Write a program to perform basic arithmetic operations on matrix.
4	(4.1) Write a program to plot a straight line.
	(4.2) Write a program to plot Sine curve.
5	Write a program to plot graph for multiple curves.
6	Write a program to perform to illustrate how the choice of activation function (or transfer function) affects the output of a neuron.
7	Write a program to classifywitha2-inputperceptron.
8	Write a program to illustrate how the perceptron learning rule works for linearly separable problems.
9	Practice of MATLAB- fuzzy logic tool.
10	Write a program to solve the tipping problem.
11	Difference between sugeno and mamdani methods.
12	Write a program for automated washing machine control.
Experiments based on advanced topics:	
13	Write a program to implement the automated washing machine control with changes in key parameters.
14	Write a program to **r**udimentary air flow mixing control.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	C	d	e	f	g	h	i	j	k
Course Learning Outcomes	1	2	2,3	3	4	4,5	3,4	2,3,5		4	

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
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PDM UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SEMESTER - II

Research Methodology

L	T	C
4	0	4

MODULE CODE	RESM0101
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: In total, EIGHT questions will be set. Question ONE will be compulsory and cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

OBJECTIVES:

The aim of teaching this subject is to impart knowledge primarily related to research methodology so that learner will be able to understand the research design and represent the research work. Some of the objectives of the course are:

1. To acquire basic knowledge research.
2. To get familiar with different types of research design.
3. To understand the basic of data collection.
4. To get familiar with the different techniques of data analysis.
5. To acquire basic knowledge of technical writing.
6. To get the knowledge of using tools and techniques in research.

LEARNING OUTCOMES:

1. Able to understand importance of research and its type.
2. Able to understand research papers and type of research design.
3. Able to formulate the research problem.
4. Able to choose the appropriate data analysis tool.
5. Able to justify with the type of research by publishing it at appropriate platform.
6. Able to use different types of softwares and techniques in research writing.

MODULE CONTENTS:

Unit I: Introduction to Research and Problem Definition Meaning, Objective and importance of research, Types of research, steps involved in research, defining research problem.
Unit II: Research Design Research Design: Concept and Importance in Research, Features of a good research design, Exploratory Research Design: concept, types and uses, Descriptive Research Designs: concept, types and uses. Experimental Design: Concept of Independent & Dependent variables. Literature Survey.
Unit III: Data collection Classification of Data, Methods of Data Collection, Sampling, Sampling techniques procedure and methods, Ethical considerations in research. Problem Identification & Formulation: Hypothesis, Qualities of a good Hypothesis, Null Hypothesis & Alternative.
Unit IV: Data analysis Statistical techniques and choosing an appropriate statistical technique, Data processing softwares (e.g. SPSS etc.), Interpretation of results. Data Preparation: Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis (Cross tabulations and Chi-square test).
Unit V: Technical Writing and reporting of research Types of research report: Dissertation and Thesis, research paper, review article, short communication, conference presentation etc., Referencing and referencing styles. Research Journals, Indexing and citation of Journals, Impact factor of Journals, Ethical issues related to publishing, Intellectual property Plagiarism and Self-Plagiarism.
Unit VI: Use of Tools and Techniques for Research Use of Encyclopedias, Research Guides, Handbook etc., Academic Databases. Methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism.

RECOMMENDED BOOKS:

TEXT BOOKS	1. C. R. Kothari, Gaurav Garg, Research Methodology Methods and Techniques , New Age International publishers, Third Edition. 2. Ranjit Kumar, Research Methodology: A Step- by- Step Guide for Beginners, 2nd Edition, SAGE, 2005 3. Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition
REFERENCE BOOKS	1. Creswell, John W. Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications, 2013. 2. Business Research Methods – Alan Bryman & Emma Bell, Oxford University Press. 3. Select references from the Internet

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	**1**	**2**	**3**	**4**	**5**	**6**
Class Test	x	x	x			
Quiz	x	x				x
Assignment		x	x	x	x	x

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	3,4	5	3,5						4		

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
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PDM UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SEMESTER – II (ELECTIVE-I)

Optimization Techniques

L	T	P
4	0	0

MODULE CODE	CSEN5214
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: In total EIGHT questions will be set. Question ONE will be compulsory and will cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

OBJECTIVES:

The aim of this subject is to teach students about different optimization techniques such as Genetic algorithm, particle swarm optimization and dynamic programming along with their implementation.

1. To understand the fundamental concepts of Optimization Techniques.
2. To make the learners aware of the importance of optimizations in real scenarios.
3. To understand the concepts of mathematics to formulate an optimization problem.
4. To understand the concepts of various classical and modern methods of for constrained and unconstrained problems in both single and multivariable.
5. To understand the concepts of GA and PSO.

LEARNING OUTCOMES:

1. Able to formulate optimization problems.
2. Able to understand the concept of optimality criteria for various type of optimization problems.
3. Solve various constrained and unconstrained problems in single variable as well as multivariable.
4. Apply the methods of optimization in real life situation.
5. Analyze and appreciate variety of performance measures for various optimization problems.

MODULE CONTENT:

UNIT-I: Introduction and Classical Optimization techniques Statement of an optimization problem, design vector design, design constraints, constraints surface, objective function and objective function surfaces, classification of optimization problems.
UNIT-II: Linear Programming Introduction to LP and formulation of Linear Programming problems, graphical solution method, alternative or multiple optimal solutions, unbounded solutions, infeasible solutions, maximization, simplex algorithm, minimization, simplex algorithm using Big-M method, two phase method, duality in linear programming, integer linear programming.
UNIT-III: Non-linear Programming Quadratic Programming with Kuhn-Tucker conditions and Wolfe's Modified simplex method, geometric programming.
UNIT-IV: Dynamic Programming Multistage decision processes, concept of sub-optimization and principle of optimality, conversion of final value problem into an initial value problem, Integer Programming: Gomory's cutting plane method, branch and bound algorithm.
UNIT-V: Genetic Algorithm Definition and concept used in GA, coding of variables, fitness function General algorithm of GA, unconstrained and constrained optimization using Genetic Algorithm, global optimization using GA. Particle Swarm Optimization Algorithm: basic fundamentals, general PSO Algorithm.
UNIT-VI: Transportation & Assignment Problems Introduction to transportation problems, various methods of transportation problem, variations in transportation problem, introduction to assignment problems, variations in assignment problems.

RECOMMENDED BOOKS:

TEXT BOOK	3. Engineering Optimization: Theory and practice by SS Rao, New Age International Pvt Ltd. 3rg edition, 1998. 4. An introduction to optimization by E. K. P. Chong and S. Zak, 2nd Edition, 2004, John Wiley and Sons (Asia) Pvt. Ltd., Singapore.
REFERENCE	3. Linear and nonlinear programming by D. Luenberger, 2nd Edition, 1984, Kluwer Academic Publisher, New York. 4. Operations Research Theory and Applications by J K Sharma, MacMillan India Ltd.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5
Class Test	x	x			x
Quiz	x		x	x	
Assignment		x		x	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	2	4	6	2	5	4					

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
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PDM UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SEMESTER –II

Mathematical Foundation of Computer Science

L	T	P
4	0	0

MODULE CODE	CSEN5215
CREDIT POINTS	4
FORMATIVE ASSESSMENT MARKS	50
SUMMATIVE ASSESSMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: In total EIGHT questions will be set. Question ONE will be compulsory and will cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

OBJECTIVES:

The aim of this subject is to clear the concepts of formal languages, and to provide keen knowledge of computation using Turing Machine.

1. Identify different formal language classes and their relationships
2. Design grammars and recognizers for different formal languages
3. Determine the decidability and intractability of computational problems
4. Present the theory of automata as the first step towards learning advanced topics such as compiler design.
5. Develop the understanding of computation using Turing machine.

LEARNING OUTCOMES:

Following this course, students will be able to:

1. Design and analyse automata, regular expressions and context-free grammars accepting or generating a certain languages
2. Define Turing machines performing simple tasks
3. Apply mathematical and formal techniques for solving problems in computer science.
4. Define formal languages and explain how they can be generated by different automata.
5. Create an automaton to solve a particular computational problem.

MODULE CONTENT:

Unit-I: Finite Automata Finite State Machines, Properties and limitations of FSM, Basic Definitions of Non-Deterministic finite automata (NDFA), Deterministic finite automata (DFA), Equivalence of DFA and NDFA, finite automata with epsilon transitions.
Unit-II: Introduction to Machines &Formal languages Concept of basic Machine, Moore and mealy Machines, Equivalence of Moore and Mealy machines. Formal Grammar's Introduction, Language recognition by the given Grammar, Creation of Grammar for particular language, Recursive & Recursive Enumerable Language, Chomsky hierarchies of grammars, unrestricted grammars, Context sensitive languages, Relation between Languages.
Unit-III: Regular Expressions & Regular Sets Regular Expressions, Equivalence of finite automata and Regular Expressions, Regular expression conversion and vice versa. State and prove Arden's Method. The Pumping Lemma for Regular Sets, Applications of the pumping lemma, Closure properties of regular sets, Myhill-Nerode Theorem and minimization of finite Automata, Minimization Algorithm.
Unit-IV: Grammars Definition, Context free and Context sensitive grammar, Ambiguity of regular grammar, Reduced forms, Removal of useless Symbols, Normal forms for grammar Chomsky Normal Form (CNF), Griebach Normal Form (GNF).
Unit-V: Pushdown Automata Introduction to Pushdown Machines, Designing of PDA, Application of Pushdown Machines, equivalence of CFL and PDA, inter conversion.
Unit-VI: Turing Machines Turing machine, Programming techniques for Turing machine, Design of T.M, Multi-tape T.M. ,Multi-level T.M., Universal Turing Machine, Halting problem of T.M., PCP Problem, Decidability & undecidability of Problems, Rice theorem.

RECOMMENDED BOOKS:

TEXT BOOK	Automata theory, language & computations by Hopcroaft & O.D.Ullman, R Mothwani, 2001.
REFERENCE	1. Automata, Languages and computation by K.L.P.Mishra & N.Chandrasekaran, 2000, PHI. 2. Introduction to formal Languages & Automata by Peter Linz, 2001, Narosa Publ. 3. Principles and Practice by Ramond Greenlaw and H. James Hoover, 1998. 4. Introduction to languages and the Theory of Computation by John C. Martin 2003, T.M.H.

METHODS OF TEACHING AND STUDENT LEARNING:

The module is delivered through lectures, on-line support, text book / course material reading. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Class Test	4	10
2	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Assessments	1	2	3	4	5
Class Test		x	x	x	x
Quiz	x	x			
Assignment	x		x	x	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	A	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	3	1,2	4	5							

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Problems encountered in the subject delivery,
- Actions taken based on previous subject review,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER – III

MODULE CODE	CATEGORY	MODULE	L	T	P	C	Internal Marks	External Marks	Total Marks
CSEN6101	PC	ADVANCED COMPUTER NETWORK	4	0	0	4	50	100	150
CSEN6102	PC	CLOUD COMPUTING	4	0	0	4	50	100	150
CSEN6103	PC	ADVANCED DATA STRUCTURES	3	0	0	3	25	75	100
CSEN6104	PC	ADVANCED DATA STRUCTURES LAB	0	0	2	1	25	25	50
CSEN6105	DI	LITERATURE SURVEY (DISSERTATION STAGE 1)*	0	0	0	2	50	50	100
	PE	ELECTIVE-II	4	0	0	4	50	100	150
	GE	ELECTIVE- Bᴪ	4	0	0	4	50	100	150
TOTAL			**19**	**0**	**2**	**22**	**300**	**550**	**850**

L = Lecture
T = Tutorial
P = Practical
C = Credit Points

PROGRAM ELECTIVE II

MODULE CODE	MODULE
CSEN6206	ARTIFICIAL NEURAL NETWORK
CSEN6207	COMPUTATIONAL TECHNIQUES using MATLAB

GENERIC ELECTIVE Bᴪ

MODULE CODE	MODULE
SAPA0320	SAP-ABAP
SAPM0321	SAP-MM
SAPS0322	SAP-SD
SAPH0323	SAP-HCM
SAPF0324	SAP-FI
MATH0303	NUMERICAL METHODS
ECEN5301	ADVANCED DIGITAL SIGNAL PROCESSING

ᴪAdditional fee, if any, shall be borne by the student

PDM UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SEMESTER – III

Advanced Computer Network

L	T	P
4	0	0

MODULE CODE	CSEN6101
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS:

In total EIGHT questions will be set. Question ONE will be compulsory and will cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

OBJECTIVE

The aim of this subject is to teach students the advanced concepts of computer networks. It will also enable students to learn advanced concepts like B-ISDN, ATM, MPLS and Ad-hoc networks.

1. To teach the basic concepts of computer networks.
2. To understand and analyse B-ISDN and ATM.
3. To make students familiar with basic B-ISDN Reference Model.
4. To teach the students about ATM based services and applications.
5. To make students familiar with Multi Protocol Label Switching.
6. To make students familiar with Ad-hoc Network Concepts.

LEARNING OUTCOMES

Following this course, students will be able:

1. To know the basics of computer networks.
2. To understand about B-ISDN and ATM.
3. To become familiar with basic B-ISDN Reference Model.
4. To understand ATM based services and applications.
5. To make students familiar with Multi Protocol Label Switching.
6. To make students familiar with Ad-hoc Network Concepts.

MODULE CONTENT

UNIT-I: Data Communication Data Communication: Data transmission, Parallel Transmission, Serial Transmission, Line Encoding Schemes: Unipolar, Polar, Bipolar, Multiplexing techniques: TDM, FDM, Modulation methods: AM, FM, PM, Pulse Code Modulation.
UNIT-II: B-ISDN and ATM Introduction to B-ISDN and ATM, B-ISDN principles, Asynchronous transfer mode, Optical Transmission, Network techniques: Networking layering, Switching of virtual channels and virtual paths, applications of virtual channel/path connections, Signalling principles: capabilities required for B-ISDN signalling, signalling virtual channels, broadband network performance, traffic management aspects: overview of functions, ATM traffic parameters and transfer capabilities, Quality of service.
UNIT-III: B-ISDN Reference Model B-ISDN reference model: general aspects, layering architecture, relationship between B-ISDN PRM and OSI reference model, B-ISDN protocol reference model description and layer functions, User Network Interface.
UNIT-IV: ATM ATM, ATM based services and applications, ATM cell structure, Cell header, ATM connections: virtual path connection, virtual channel connection. ATM switching: matrix type, central memory, ring type switching element. Switching networks: Single stage networks, Multi-stage networks, ATM transmission: cell transfer functions, transmissions systems
UNIT-V: Multi Protocol Label Switching (MPLS) Multi Protocol Label Switching (MPLS), How MPLS works, Installing and removing MPLS paths ,Comparison of MPLS versus IP , MPLS local protection , Comparison of MPLS versus Frame Relay, Comparison of MPLS versus ATM , Comparison of MPLS VPN versus IPSec VPN, Access to MPLS networks , Benefits of MPLS.
UNIT-VI: Ad-hoc Network Ad-hoc Network Concepts, Routing in Ad-hoc networks, routing protocols.

RECOMMENDED BOOKS

TEXT BOOK	1. Data Communications and Networking by Forouzan, TMH, 4th Edition, 2006. 2. Computer Networks (4th edition) by Tanenbaum Andrew S., International edition, 2004. 3. ATM Networks, Concepts Protocols &Applications by Rainer Handel, third edition. 4. Ad-hoc Networks by Charles E. Perkins.
REFERENCE	1. Data and Computer Communications by William Stallings, PHI, 7thEdition, 2003. 2. Communication Networks, Fundamental Concepts and Key Architecture by Leon-Garcia, Widjaja, TMH, 2nd Edition, 2004.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Assessments	1	2	3	4	5	6
Class Test	x	x	x			x
Quiz	x			x		x
Assignment	x	x	x	x	x	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes		1		2,3	6	4	5				

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
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PDM UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SEMESTER - III

Cloud Computing

L	T	P
4	0	0

MODULE CODE	CSEN6102
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: In total EIGHT questions will be set. Question ONE will be compulsory and will cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

OBJECTIVES:

1. To impart fundamental concepts in the area of cloud computing.
2. To impart knowledge in applications of cloud computing.
3. To provide students with the fundamentals and essentials of cloud computing.
4. To provide students a sound foundation of the cloud computing so that they are able to start using and adopting cloud computing services and tools in their real life scenarios.
5. To understand the systems, protocols and mechanisms to support cloud computing.

LEARNING OUTCOMES:

Following this course, students will be able to:

1. Articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing.
2. Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.
3. Explain the core issues of cloud computing such as security, privacy, and interoperability.
4. Identify problems, analyze, and evaluate various cloud computing solutions.
5. Attempt to generate new ideas and innovations in cloud computing.

MODULE CONTENT:

Unit-I: Introduction to Cloud Computing, Definition, Characteristics, Components, Cloud provider, SAAS, PAAS, IAAS and Others, Organizational scenarios of clouds, Administering & Monitoring cloud services, benefits and limitations, Deploy application over cloud, Comparison among SAAS, PAAS, IAAS, Cloud computing platforms: Infrastructure as service: Amazon EC2,Platform as Service: Google App Engine, Microsoft Azure.
Unit-II: Introduction to Cloud Technologies, Study of Hypervisors, SOAP, REST, Compare SOAP and REST, Web services, AJAX and mashups-Web services, Mashups: user interface services, Virtual machine technology, virtualization applications in enterprises, Pitfalls of virtualization, Multi-entity support, Multi-schema approach, Multi-tenance using cloud data stores, Data access control for enterprise applications.
Unit-III: Data in the cloud: Relational databases, Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo, Map-Reduce and extensions: Parallel computing, The map-Reduce model, Parallel efficiency of Map-Reduce, Relational operations using Map-Reduce, Introduction to cloud development, Monitoring in Cloud, A grid of clouds, Mobile Cloud Computing, Sky computing, Utility Computing, Elastic Computing.
Unit-IV: Cloud security fundamentals, Vulnerability assessment tool for cloud, Privacy and Security in cloud, Cloud computing security architecture, Cloud computing security challenges, Issues in cloud computing, Implementing real time application over cloud platform, Issues in Inter cloud environments, QoS Issues in Cloud, Dependability, data migration, streaming in Cloud. Quality of Service (QoS) monitoring in a Cloud computing environment, Inter Cloud issues, load balancing, resource optimization.
Unit-V: Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics: cloud computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs (e.g Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat).
Unit-VI: Application development: Service creation environments to develop cloud based applications. Development environments for service development; Amazon, Azure, Google App. Cloud it model: Analysis of Case Studies when deciding to adopt cloud computing architecture. How to decide if the cloud is right for your requirements. Cloud based service, applications and development platform deployment so as to improve the total cost of ownership (TCO).

RECOMMENDED BOOKS:

TEXT BOOKS	1. Cloud Computing: A Practical Approach by Antohy T Velte, et.al McGraw Hill. 2. Cloud Computing for Dummies by Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper(Wiley India Edition). 3. Cloud Security & Privacy by Tim Malhar, S.Kumaraswammy, S.Latif (SPD,O'REILLY).
REFERENCEBOOKS	1. Cloud Computing Bible by Barrie Sosinsky, Wiley India. 2. Cloud Applications by George Reese, O'REILLY Publication. 3. Cloud Security by Ronald Krutz and Russell Dean Vines, Wiley-India.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5
Class Test	x		x		
Quiz		x	x	x	
Assignment	x				x

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	2	3	5	2	5	3					

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
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PDM UNIVERSITY
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SEMESTER - III

Advanced Data Structures

L	T	P
3	0	0

MODULE CODE	CSEN6103
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: In total EIGHT questions will be set. Question ONE will be compulsory and will cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

OBJECTIVES:

The aim of this subject is to teach students about different data structures such as Balanced Search Trees, Heaps, Graphs and Spanning Trees along with their implementation.

1. To understand the abstract data types stack, queue and linked list.
2. Describe and implement a variety of advanced data structures (hash tables, priority queues, balanced search trees, graphs).
3. To analyze the space and time complexity of the algorithms.
4. Identify different solutions for a given problem related to data structures.
5. Comprehend and select algorithm design approaches in a problem specific manner.

LEARNING OUTCOMES:

1. Choose appropriate data structure as applied to specified problem definition.
2. Develop knowledge of applications of data structures including the ability to implement algorithms for the creation, insertion, deletion, searching and sorting.
3. Analyze and compare algorithms for efficiency using Big-O notation.
4. Use linear and non-linear data structures like stacks, queues and linked list etc.
5. Implement projects requiring the implementation of the above data structures.

MODULE CONTENT:

UNIT I: Elementary Structures Arrays, Stacks, Queues, Linked List, Double Ended Queue, Dynamic Allocation of Nodes.
UNIT II: Search Trees Two models of Search Trees, Height of a Search Tree, Basic Find, Insert and Delete, Building Optimal Search Tree, Converting trees into Lists, Balanced Search Trees: Height-Balanced Trees, Weight-Balanced Trees, AVL Trees, Red-Black Trees, Splay Trees, B-Trees, Joining and Splitting Balanced Search Trees.
UNIT III: Heaps Balanced Search Trees as Heap, Array Based Heaps, Binomial Heaps, Fibonacci Heaps, Heaps of Optimal Complexity.
UNIT IV: Data Structures for Strings Tries and Compressed Tries, Dictionaries allowing Errors in Queries, Suffix Trees, Suffix Arrays, String Searching.
UNIT V: Graphs Representation, Type of Graphs, Paths and Circuits: Euler Graphs, Hamiltonian Paths & Circuits, Searching a Graph: Depth First Search and Breadth First Search.
UNIT VI: Minimum Spanning Tree Prim's and Kruskal's algorithms, Shortest-path Algorithms: Dijkstra's and Floyd's algorithm, Topological sort, Ford-Fulkerson algorithm.

RECOMMENDED BOOKS:

TEXT BOOK	5. Advanced Data Structures, Peter Brass, Cambridge University Press. 6. Handbook of Data Structures and Applications, Dinesh P. Mehta and Sartaj Sahni.
REFERENCE	5. Fundamentals of Data Structures in C. Horowitz, Ellis, Sahni, Sartaj & Anderson-Freed, Universities Press. 6. Introduction to Algorithms, T. H. Cormen, C. E. Leiserson, R.L. Rivest, C. Stein, PHI.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5
Class Test	x	x			
Quiz		x		x	x
Assignment		x		x	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	1	3	1,2	2	2	2		5			

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
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PDM UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SEMESTER - III

Advanced Data Structures Lab

L	T	P
0	0	2

MODULE CODE	CSEN6104
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to different data structures like stacks, queues, limked lists, trees , graphs etc:

1. Describe and apply advanced data structures and algorithms design techniques to solve computational problems.
2. To strengthen the ability to identify and apply the suitable data structure for the given real world problem.
3. To gain knowledge in practical applications of data structures.
4. Choose the appropriate data structure for modeling a given problem.
5. Analyze the complexity and performance of the algorithms and data structure.
6. Solve problems using the fundamental graph algorithms, including depth-first and breadth- first search, topological sort, minimum spanning tree algorithm and single-source shortest path.

LEARNING OUTCOMES:

1. Define basic static and dynamic data structures and relevant standard algorithms for stack, queue, linked lists, trees, graphs, sorting algorithms, min-max algorithm.
2. Explain advantages and disadvantages of specific algorithms and data structures.
3. To access how the choices of data structure & algorithm methods impact the performance of program.
4. Analyze the time and space efficiency of the data structures.
5. Have practical knowledge on the applications of data structures.

PDM UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

LIST OF EXPERIMENTS

1.	Write a program to implement Stack ADT using linked list.
2.	Write a program to implement Queue ADT using linked list.
3.	Write a program to generate the binary tree from the given in-order and post-order traversal.
4.	Write a program to generate the binary tree from the given in-order and pre-order traversals.
5.	Write a program for Binary Search Tree to implement following operations: a. Insertion b. Deletion
6.	Write a program for Binary Search Tree to implement following operations: a. Finding an element b. Finding Min element c. Finding Max element
7.	Write a program for Binary Search Tree to implement following operations: d. Finding left child of the given node e. Finding right child of the given node
8.	Write a program for AVL Tree to implement following operations: (For nodes as integers) a. Insertion: Test program for all cases (LL, RR, RL, LR rotation) b. Deletion: Test Program for all cases (R0, R1, R-1, L0, L1, L-1) c. Display: using set notation.
9.	Write a program to implement Red-Black trees with insertion and deletion operation for the given input data as Strings.
10.	Write a program to implement insertion, deletion, display and search operation in m-way B tree (i.e. a non-leaf node can have at most m children) for the given data as integers (Test the program for m=3, 5, 7).
11.	Write a program to implement Make_Heap, Insertion, Find_Min, Extract_Min, Union, Decrease_Key and Delete_Key operations in Binomial Heap for the given data as strings.
12.	Write a program to perform topological sort on dag using depth first search.
Experiments based on advanced topics:	
13.	Write a program to generate minimum spanning tree in a connected, undirected weighted graph using Prims's algorithm with disjoint set data structures.
14.	Write a program to generate minimum spanning tree in a connected, undirected weighted graph using Kruskal's algorithm with disjoint set data structures.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	50
2	External Assessment	1	50

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	4		3,5			1		5			

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER - III

Literature Survey (Dissertation Stage 1)

L	T	P
0	0	0

MODULE CODE	CSEN6105
CREDIT POINTS	2
FORMATIVE ASSESSMENT MARKS	100
SUMMATIVE ASSESSMENT MARKS	-
END SEMESTER EXAM DURATION	-
LAST REVISION DATE	

A candidate has to prepare a report covering identification of research topic, literature review, planning of research scheme and systematic documentation. The marks will be given on the basis of a review paper publication; report prepared covering the above said contents, contents of the presentation, communication and presentation skills.

PDM UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SEMESTER – III (ELECTIVE-II)

Artificial Neural Network

L	T	P
4	0	0

MODULE CODE	CSEN6206
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: In total EIGHT questions will be set. Question ONE will be compulsory and will cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

OBJECTIVES:

The aim of this subject is to teach students basic models, learning algorithms, and some applications of neural networks.

1. To understand basic neuron models: McCulloch-Pitts model and the generalized one neuron model, radial basis function model, etc.
2. To understand basic neural network models: multilayer perceptron, distance or similarity based neural networks, associative memory and self-organizing feature map.
3. To make students familiar with basic learning algorithms: the delta learning rule, the back propagation algorithm, self-organization learning etc.
4. To understand applications like pattern recognition, function approximation, information visualization, etc.

LEARNING OUTCOMES:

Following this course student will be able to:

1. Understand the fundamentals and types of neural networks.
2. Develop the different algorithms for neural networks.
3. Expose the concepts of feed forward neural networks.
4. Expose the concepts of feedback neural networks.

MODULE CONTENT:

UNIT-I: Introduction and ANN Structure Biological neurons and artificial neurons, Models of an ANN, Activation functions used in ANNs, Typical classes of network architectures, feed forward, feedback, types of learning, supervised and unsupervised, Re-inforcement learning ,learning rules.
UNIT-II: Neural Network Models Single Layer Perceptron Classifier, Multilayer Feed forward Network, Single-Layer Feedback Networks, Knowledge, representation and acquisition. Basic Hop field model, Competitive learning, K-means clustering algorithm, Kohonen‘s feature maps.
UNIT-III: Single layer perceptrons Structure and learning of perceptrons, Pattern classifier - introduction and Bayes' classifiers, Perceptron as a pattern classifier , Perceptron convergence , Limitations of a perceptrons.
UNIT-IV: Feedforward ANN Structures of Multi-layer feedforward networks, Back propagation algorithm, Back propagation - training and convergence, Functional approximation with back propagation, Practical and design issues of back propagation learning
UNIT-V: Radial Basis Function Networks Pattern separability and interpolation, Regularization Theory, Regularization and RBF networks, RBF network design and training, Approximation properties of RBF.
UNIT-VI: Support Vector machines Linear separability and optimal hyper plane, Determination of optimal hyper plane, Optimal hyper plane for nonseparable patterns, Design of an SVM, Examples of SVM.

RECOMMENDED BOOKS:

TEXT BOOK	Introduction to artificial neural systems by J.M. Zurada , Jaico Publishing House.
REFERENCE	1. Neural Networks: A comprehensive foundation by Simon Haykin, Second Edition, Pearson Education Asia 2. Neural Networks: A classroom approach by Satish Kumar Tata McGraw Hill, 2004. 3. Artificial Neural Networks by Robert J. Schalkoff McGraw-Hill International Editions, 1997. 4. Artificial Neural Networks by B. Yegnanarayana, PHI. 5. Neural Networks by Simon Haykin, HI, 3rd edition, 2010.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5
Class Test	x			x	x
Quiz		x	x		
Assignment	x			x	x

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes		1	2	2,3	3,4	3,4					

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
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PDM UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SEMESTER - III

Computational Techniques using MATLAB

L	T	P
4	0	0

MODULE CODE	CSEN6207
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: In total EIGHT questions will be set. Question ONE will be compulsory and will cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

OBJECTIVES:

1. To understand the basic concepts of MATLAB, types of computer errors in MATLAB.
2. To be familiar with the different methods and techniques used solving linear equations.
3. To understand the concept of Curve Fitting.
4. To introduce the concept of numerical differentiation / integration using MATLAB.
5. To make students familiar with optimization techniques using MATLAB.

LEARNING OUTCOMES:

Following this course, students will be able to:

1. Apply the knowledge of MATLAB to develop programs.
2. Design & conduct experiments for Curve Fitting.
3. Design & implement a software system for numerical methods techniques.
4. Understand how to deal with different linear / non-Linear equations.
5. Apply knowledge to develop program to solve complex problems.

MODULE CONTENT:

Unit-I: MATLAB Usage and Computational Errors: MATLAB Usage and Computational Errors: Introduction to MATLAB, Types of Computer Errors, IEEE 64-bit Floating-Point Number Representation, Vectors in MATLAB, Efficient programming techniques,System of Linear Equations: Solution for a System of Linear Equations, Solving a System of Linear Equations, Inverse Matrix, Decomposition (Factorization), Iterative Methods to Solve Equations.
Unit-II: Interpolation and Curve Fitting: Interpolation and Curve Fitting: Interpolation by Lagrange, Newton, and Chebyshev Polynomial, Hermite Interpolating Polynomial, Cubic Spline interpolation, Straight Line, Polynomial Curve, and Exponential Curve Fit, Fourier transform.
Unit-III: Nonlinear Equations: Nonlinear Equations: Bisection Method, RegulaFalsi Method, Newton Raphson Method, Secant Method, Newton Method for a System of Nonlinear Equations.
Unit-IV: Numerical Differentiation/Integration: Numerical Differentiation/Integration: Difference Approximation for First Derivative, Approximation Error of First Derivative, Numerical Integration and Quadrature, Trapezoidal Method and Simpson Method, Romberg Integration, Adaptive and Gauss Quadrature.
Unit-V:Ordinary Differential Equations: Ordinary Differential Equations: Euler's Method, Runge–Kutta Method, PredMEor–Corrector Method, Vector Differential Equations, Boundary Value Problem (BVP).
Unit-VI: Optimization: Optimization: Unconstrained Optimization, Constrained Optimization, MATLAB Built-In Routines for Optimization, Matrices and Eigenvalues: Eigenvalues and Eigenvectors, Power Method, Jacobi Method Partial Differential Equations: Elliptic, Hyperbolic, and Parabolic PDE, Finite Element Method (FEM) for solving PDE.

RECOMMENDED BOOKS:

TEXT BOOKS	1. Applied Numerical methods using MATLAB by W. Y. Yang, Wiley Publications, 2005. 2. Applied Numerical Methods with MATLAB by Steven C. Chapra, McGraw-Hill, 2005.
REFERENCE BOOKS	1. Numerical Methods using MATLAB by John H. Mathews, Prentice Hall. 2. Introduction to MATLAB® for Engineersby W.J Palm, McGraw-Hill.

METHODS OF TEACHING AND STUDENT LEARNING

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ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5
Class Test	x		x		
Quiz				x	x
Assignment	x				x

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	1	3	2	4	2	3		5			

EVALUATION

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SEMESTER - IV

MODULE CODE	CATEGORY	MODULE	L	T	P	C
CSEN6108	DI	DISSERTATION and VIVA (DISSERTATION STAGE 2)	-	-	-	10
TOTAL CREDITS			**0**	**0**	**0**	**10**

L = Lecture
T = Tutorial
P = Practical
C = Credit Point

Students have to publish a research paper in a journal / conference of the research work done in the semester.